IN the *Bollettino* of the Italian Geographical Society, Signor Cesare Cipolletti continues his papers on the Argentine Republic, dealing with the regions of the Rio Negro and the Rio Colorado. Appended to a note on the Italian sphere of influence in Africa is a map showing the boundaries of the colony of Eritrea, compiled from official sources.

A PAPER by Herr S. Puchleitner in the *Mittheilungen* of the Vienna Geographical Society, on the glacial period in the Southern Carpathians, gives an excellent summary of recent research in this region, and more especially of de Martonne's valuable work on cirques. Dr. Kurt Hassert publishes an account of his journey through Montenegro during the summer of 1900, in the same number.

Petermann's Mittheilungen contains an article on the magnetic work to be undertaken by the German South Polar Expedition, by Dr. Bidlingmaier, the meteorologist and magnetician of the expedition. It includes the official programme of observations on the term days, and of the international scheme of cooperation, whereby it is hoped to obtain synoptic charts showing the magnetic condition of the whole globe on these days. Dr. Hans Gazert, the doctor of the Expedition, also contributes a paper on the bacteriological problems to be investigated.

A NUMBER of the *Abhandlungen* of the Vienna Geographical Society, just issued, contains a paper on the contrasts in climate on the east and west coast regions of continents in extra-tropical latitudes, by Dr. Ludwig Coellen. The author arranges the results of observations, chiefly obtained from tables published by Buchan, Hann and Woeikof, in such a way as to clearly bring out the salient points of difference; but it may be doubted if the selection of individual stations on which his generalisations are based is always satisfactory. We note that the direct influence of ocean currents is properly relegated to a secondary place.

IN a former paper on barisâl guns, &c., in the province of Umbria (*Boll. Soc. Sismol. Ital.*, vol. iii. 1897, pp. 222–234), Dr. Cancani attributes these phenomena to endogenous causes. He continues the subject in the last number of the same journal (vol. vii. 1901, pp. 23–47), describing similar noises which have been observed in the districts round Isernia and Cosenza and in Umbria and Latium. In the latter case he argues that the sounds were neither of artificial nor of atmospheric origin; and, as slight tremors were noticed in some instances to accompany them, his views receive considerable support from the recent observations.

MEMOIRS and notes upon many aspects of polar exploration are included in the "Antarctic Manual" prepared for the use of the members of the British Antarctic expedition. Mr. George Murray, F.R.S., is the editor of the manual, and Sir Clements Markham, K.C.B., contributes a preface in which he surveys the contents, and remarks that the volume "is presented to the expedition by the president and council of the Royal Geographical Society," so that the Royal Society is not officially concerned with the work. Among the subjects of papers in the volume are:—ice nomenclature, astronomical data, tidal observations, pendulum observations, terrestrial magnetism, climate, wave observations, the aurora, atmospheric electricity, chemical and physical notes, geology, volcanoes and volcanic action, ice observations, the collection of rocks and minerals, zoology, botany, sledge-travelling, geography, and an Antarctic bibliography. The manual thus contains in a compact form practically all that is known about South Polar regions, and also records of experience in Arctic exploration.

THE additions to the Zoological Society's Gardens during the past week include a Crab-eating Raccoon (*Procyon cancrivorus*) from South America, presented by Mr. George Lancefield; a Wild Swine (*Sus scrofa*) from Persia, presented by Mr. B. T. Ffinch; a Cardinal Grosbeak (*Cardinalis virginianus*), two Bluebirds (*Sialia wilsoni*) from North America, presented by Colonel Ashburner; a Golden Eagle (*Aquila chrysaetos*) from Scotland, presented by Mr. J. Monro Walker; two Stone Curlews (*Ædicnemus scolopax*), British, presented by Mr. A. E. Chaplin; an Orange-cheeked Waxbill (*Estrelda melpoda*) from West Africa, presented by Mr. W. S. Primley; a Kinkajou (*Cercoleptes caudivolvulus*) from South America, deposited; a Hoffmann's Sloth (*Cholopus hoffmanni*) from Panama, purchased.

OUR ASTRONOMICAL COLUMN.

ENCKE'S COMET.—A telegram sent out from Harvard College Observatory announces that the first observation of this periodic comet was made by Prof. Wilson at Northfield, on Monday evening, August 5.

The determination of position was as follows:—

$$\left.\begin{array}{l}\text{R.A.} = 6\text{h. } 2\text{m. } 2{\cdot}8\text{s.}\\ \text{Decl.} = +\ 31^\circ\ 42'\ 30''\end{array}\right\}(1901).\quad \begin{array}{c}\text{August 5d. 9h. 25m. 3s.}\\ \text{G.M.T.}\end{array}$$

OBSERVATIONS OF MARS.—In the *Bulletin de la Soc. Astronomique de France* (1901, pp. 345–355), MM. Flammarion and Antoniadi give an account of their new observations of the planet Mars made at the Juvisy Observatory during the period 1900 October 23 and 1901 July 6. Two charts are given, one showing the northern hemisphere as a polar projection, the other giving the zone from +80° to −50° lat. on Mercator's projection.

Tables are given showing the varying dimensions of the North Polar snow-cap, which at the summer solstice had a diameter of about twenty degrees. The charts are described in detail, showing the differences from former observations. Attention is again drawn to the half-tone shading which apparently extends over the northern hemisphere from the pole to latitude 45°, limited towards the south by the region containing the canali.

At Juvisy, fifty canali have been seen, forty-six of which agree with the observations of Schiaparelli, and one from the list of Cerulli. Only three cases of gemination have been noticed, the most prominent being Cerberus and Casius, which were visible without difficulty. The Styx was also suspected of duplicity, but the components were not sharply separated.

VARIATIONS OF THE MAGNETIC NEEDLE.—M. Souleyre commences a discussion of the possible causes of the variations of the magnetic needle, and in his first article outlines the production of currents and other disturbances in the solar corona by the action of the planets, these reacting on the supposed electrical constitution of the corona and other solar surroundings. The extension of the theory to explain the periodicity of sunspots, terrestrial magnetic storms and auroræ is then presented, special attention being given to the effect of planetary disturbance (*Bull. Soc. Ast. de France*, 1901, pp. 362–370).

VARIATION OF EROS.—Supplementing his recent note, M. André furnishes a few further particulars concerning the form of light-curve and amplitude of the determined variation, in *Comptes rendus* (cxxxiii. pp. 324–326). When observed on the same evening, the minima of two orders were not quite identical. The form of the light-curve in the neighbourhood of the minima did not sensibly change during the observations, but a considerable degree of change has occurred about the points of maxima. A table is included showing the amplitudes of the variation observed on nineteen evenings during February, March and April, 1901, ranging from 2·0 magnitudes to zero.

ORBITS OF ALGOL VARIABLES, RR PUPPIS AND V PUPPIS.—Dr. A. W. Roberts has computed the characteristic features of the orbits of these two variables from observations secured at his private observatory, Lovedale, South Africa. Of the two variables, V Puppis is specially interesting from the fact that it is a spectroscopic binary, so that more refined measurements in the line of sight may possibly enable the absolute masses of the system to be determined.

RR Puppis.—

$$\left.\begin{array}{l}\text{R.A.} = \quad 7\text{h. } 43\text{m. } 31\text{s.}\\ \text{Decl.} = -41^\circ\ 7'{\cdot}6\end{array}\right\}(1900{\cdot}0).$$

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This star has been under observation for nearly twelve months, and some 200 measures obtained. The period adopted is

6d. 10h. 19·6m.,

and the light-curve based on this value is given, with an enlarged diagram of the part near minimum. The curve is almost identical in form with that of S Velorum. Other details are as follows :—

Limits of variation are 9·1 and 10·8 magnitude.
Duration of increasing or decreasing phase = 4h. 15m.
Stationary period at minimum = 8h. 30m.

The system thus apparently consists of two bodies, one of which is *three* times the diameter of the other. The smaller star is nearly twice as bright as the larger one, and the distance between their circumferences is about two-thirds of the radius of the orbit. The density of the system is probably not more than one-sixth that of the sun.

V Puppis.

$$\left.\begin{array}{l}\text{R.A.} = 7\text{h. } 55\text{m. } 22\text{s.}\\ \text{Decl.} = -\ 48^\circ\ 58'\cdot 4\end{array}\right\}(1900\cdot 0).$$

This star differs from the preceding one in that it consists of two bodies of about equal size and brightness. The mean period, as deduced from the light variation, is

1d. 10h. 54m. 26·7s.

The light-curve of this star is strikingly similar to that of U Pegasi, showing double and *unequal minima*, and double and *equal maxima*.

Prof. Pickering, however, from spectroscopic determinations, deduces a period of

3d. 2h. 46m.

From the peculiarity of there being no stationary period at either maximum, Dr. Roberts infers that the two component stars revolve around each other *in actual contact*. Under such conditions, both bodies would most probably undergo distortion. The value derived for the density of V Puppis is 0 0? that of the sun, the orbit being circular.

POLISH.[1]

THE lecture commenced with a description of a home-made spectroscope of considerable power. The lens, a plano-convex of 6 inches aperture and 22 feet focus, received the rays from the slit, and finally returned them to a pure spectrum formed in the neighbourhood. The skeleton of the prism was of lead ; the faces, inclined at 70°, were of thick plate-glass cemented with glue and treacle. It was charged with bisulphide of carbon, of which the free surface (of small area) was raised above the operative part of the fluid. The prism was traversed twice, and the effective thickness was 5½ inches, so that the resolving power corresponded to 11 inches, or 28 cm., of CS_2. The liquid was stirred by a perforated triangular plate, nearly fitting the prism, which could be actuated by means of a thread within reach of the observer. The reflector was a *flat*, chemically silvered in front.

So far as eye observations were concerned, the performance was satisfactory, falling but little short of theoretical perfection. The stirrer needed to be in almost constant operation, the definition usually beginning to fail within about twenty seconds after stopping the stirrer. But although the stirrer was quite successful in maintaining uniformity of temperature as regards *space*, *i.e.* throughout the dispersing fluid, the temperature was usually somewhat rapidly variable with *time*, so that photographs requiring more than a few seconds of exposure showed inferiority. In this respect a grating is more manageable.

The lens and the faces of the prism were ground and polished (in 1893) upon a machine kindly presented by Dr. Common. The flat surfaces were tested with a spherometer, in which a movement of the central screw through 1/100000 inch could usually be detected by the touch. The external surfaces of the prism faces were the only ones requiring accurate flatness. In polishing, the operation was not carried as far as would be expected of a professional optician. A few residual pittings, although they spoil the appearance of a surface, do not interfere with its performance, at least for many purposes.

In the process of grinding together two glass surfaces, the particles of emery, even the finest, appear to act by *pitting* the glasses, *i.e.* by breaking out small fragments. In order to save time and loss of accuracy in the polishing, it is desirable to carry the grinding process as far as possible, using towards the close only the finest emery. The limit in this direction appears to depend upon the tendency of the glasses (6 inches diameter) to *seize*, when they approach too closely, but with a little care it is easy to attain such a fineness that a candle is seen reflected at an angle of incidence not exceeding 60°, measured as usual from the perpendicular.

The fineness necessary, in order that a surface may reflect and refract regularly without diffusion, viz. in order that it may appear *polished*, depends upon the wave-length of the light and upon the angle of incidence. At a grazing incidence all surfaces behave as if polished, and a surface which reflects red light pretty well may fail signally when tested with blue light at the same angle. If we consider incidences not too far removed from the perpendicular, the theory of gratings teaches that a regularly corrugated surface behaves as if absolutely plane, provided that the *wave-length* of the corrugations is less than the wave-length of the light, and this without regard to the *depth* of the corrugations. Experimental illustrations, drawn from the sister science of acoustics, were given. The source was a bird-call from which issued vibrations having a wave-length of about 1·5 cm., and the percipient was a high-pressure sensitive flame. When the bird-call was turned away, the flame was silent, but it roared vigorously when the vibrations were reflected back upon it from a plate of glass. A second plate, upon which small pebbles had been glued so as to constitute an ideally rough surface, acted nearly as well, and so did a piece of tin plate suitably corrugated. In all these cases the reflection was *regular*, the flame becoming quiet when the plates were turned out of adjustment through a very small angle. In another method of experimenting the incidence was absolutely perpendicular, the flame being exposed to both the incident and the reflected waves. It is known that under these circumstances the flame remains quiescent at the *nodes* and flares most vigorously at the *loops*. As the reflector is drawn slowly back, the flame passes alternately through the nodes and loops, thus executing a cycle of changes as the reflector moves through *half* a wave-length. The effects observed were just the same whether the reflector were smooth or covered with pebbles, or whether the corrugated tin plate were substituted. All surfaces were smooth *enough* in relation to the wave-length of the vibration to give substantially a specular reflection.

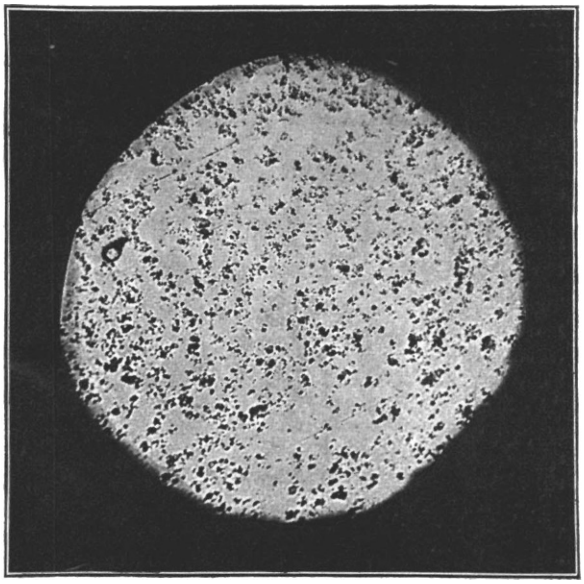

FIG. 1

Finely ground surfaces are still too coarse for perpendicular specular reflection of the longest visible waves of light. Here the material may be metal, or glass silvered chemically on the

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[1] A discourse delivered at the Royal Institution on Friday, March 29, by the Right Hon. Lord Rayleigh, F.R.S.

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